



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND
TOXIC SUBSTANCES

Memorandum

SUBJECT: Analysis of Disulfoton Use on Fraser Fir Christmas Trees in Western North Carolina.

FROM: Colwell A. Cook, Entomologist
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THRU: Arnet Jones, Chief
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TO: Christina Scheltema, Chemical Review Manager
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Special Review and Reregistration Division

DATE OF PEER REVIEW: July 3, 2002

Introduction

The Special Review and Reregistration Division (SRRD) has requested that the following documents, originally prepared by Michael K. Hennessey and incorporated below, be reviewed prior to their being placed in the docket and on the web. These documents were originally written to answer if the organophosphate, disulfoton, was critical to the Fraser fir Christmas tree industry in western North Carolina.

BEAD has reviewed the documents and has determined that they reflect the state of knowledge for the time in which they were written, July 2000. BEAD feels compelled to mention that several of the alternatives listed in the documents are currently under review for reregistration and some chemicals are still in the registration pipeline and should not be considered as alternatives.

The following are Mike's documents submitted to SRRD on July 5, 2000.

Site: Fraser Fir Christmas Trees

This analysis focuses on the level of need for OPs and alternatives for Fraser firs.

All Fraser firs are grown in the mountainous areas of North Carolina where they are the major agricultural commodity. They are perennial with a 6-10 year crop cycle. In 1996, 34 million trees were grown on 24,000 acres by 1,600 growers. Over 66% of the growers had <10 acres. About 10-20% of the trees are harvested annually around Christmastime. Seventy-five percent of the harvest is for the wholesale market and 25% is for the retail, choose-and-cut market. The value for 1996 was \$78 million and for 1999 was \$122 million. Trees for harvest are graded either by USDA or according to the NC Christmas Tree Association standards. Fraser firs represented 27% of the US-grown Christmas tree market in 1999. Commercial Christmas trees of other varieties are mainly grown in OR, MI, WA, OH, and WI.

Six pests are of concern to growers. OPs are critically needed for four of the pests. Crop loss comes mainly from cosmetic damage to foliage visible in the last year or two before harvest or tree death (balsam wooly adelgid). Before the last two years, trees can usually compensate for foliage loss. Large trees (6-7 ft tall) are most valuable. Choice of pesticide for a given pest depends upon timing, row spacing, land slope, size of trees, and acreage. Generally, pesticides applied foliarly on small trees may not be suitable for large trees after canopies are closed. Small acreage (because of cost) and acreage planted without tractor rows are not generally amenable to foliar spraying that requires access by truck or tractor. Because of mountainous terrain, aerial spraying is not generally done.

Balsam twig aphid and spruce spider mite are widespread and perennial pests. Impacts are greatest near harvest when trees may be downgraded for cosmetic damage. Disulfoton, a systemic soil granular applied by either hand or motorcycle, is most used followed by foliarly-applied chlorpyrifos and esfenvalerate. Disulfoton has the advantages of controlling both balsam twig aphid and spruce spider mite, and, being systemic, conserving predators. Disulfoton and esfenvalerate may be alternated if resistance management becomes an issue. Chlorpyrifos and esfenvalerate must be foliarly-applied by commercial applicator by mist blower or high-powered hose sprayer. The chlorpyrifos foliar spray is phytotoxic in some situations. Foliar applications are problematic because they are usually uneven, which significantly affects efficacy. Disulfoton is also the pesticide most used against spruce spider mite, followed by chlorpyrifos. Esfenvalerate has the advantage of also controlling balsam wooly adelgid to a limited extent but the disadvantage of causing spider mite populations to increase.

The other four pests are minor but may be important in spotty situations. Hemlock rust mite and rosette bud mite are mainly controlled with foliarly-applied dimethoate. There is no alternative to dimethoate for rosette bud mite. Balsam wooly adelgid is a major pest of spotty distribution that is mainly controlled with esfenvalerate spraying. If it is not controlled, the tree is killed or culled. White grubs are not very widespread and are controlled with soil-applied chlorpyrifos at plant.

Overall, for trees nearing harvest, twig aphids and spider mites are the critical pests

annually. Under those conditions, disulfoton is the OP that is critically needed because alternatives are somewhat ineffective. Without disulfoton, a significant amount of loss from downgrading and extra application costs would be sustained over the region annually. Disulfoton is important in resistance management and conserving beneficials.

Sources:

USDA Crop Profile for Christmas Trees in the North Carolina Mountains. 11/99.

Personal Observation. NC Christmas Tree Crop tour with NC Cooperative Extension Service. 6/25-27/00.

Pesticide labels. Metasystox-R, Dimethoate 4EC, Di-Syston 15%, Lorsban 4E. 6/00.

Sidebottom, J. Personal communication. 6/22/00.

Sidebottom, J. 1999. NC Crop Profile Christmas Trees, Mountain.

1997 North Carolina Christmas Tree Survey. NCASS. 3/98.

[Www.agr.state.nc.us/stats/trees/xmastree.htm](http://www.agr.state.nc.us/stats/trees/xmastree.htm)

Prepared by: Michael K. Hennessey, Entomologist, EPA/OPP/BEAD/HIB, 7/5/00.

OP TOLERANCE REASSESSMENT USE/USAGE MATRIX CROP SUMMARY

Site: Fraser Fir Christmas Trees					Overall Confidence Rating: H			
Background: this analysis focuses on OP use. North Carolina is the only producer. Perennial crop with 6-10 year crop cycle. 34 million trees were grown on 24,000 acres with 1,600 growers in 1996. 66% of the farms are <10 acres. 93% of the trees were grown in five NC counties. Trees are cut and shipped fresh for homeowner ornamental use around Christmastime annually. 25% of the trees sold are retail. Value was \$78 million in 1996 and \$122 million in 1999. Commodity represented 27% of all US grown Christmas trees sold in 1999. Commercial Christmas trees of other varieties are produced in OR, MI, WA, OH, and WI.								
Organophosphate Pesticides	% Treated		# Applications		Rate (lb AI/A)		PHI (days)	
	Max	Avg	Max	Avg	Max	Avg	Min	Avg
Disulfoton	72	65	2	1	4.5	3	2	>14
Chlorpyrifos	7	6	2	1	1	0.25	1	1
Oxydemeton methyl	2	1	2	1	1	0.5	3	3
Dimethoate	11	10	2	1	0.67	0.67	2	2

Confidence Rating: H= high confidence = data from several confirming sources; confirmed by personal experience
M = medium confidence = data from only a few sources; may be some conflicting or unconfirmed info.
L = low confidence = data from only one unconfirmed source

Organophosphate Target Pests for Fraser Fir	
Major	balsam twig aphid, spruce spider mite
Minor	hemlock rust mite, rosette bud mite, balsam wooly adelgid, white grubs

Major = 20+% of all OP usage on pest; Moderate = 5-20% of all OP usage on pest; Minor =<5% of all OP usage on pest

Sources:

USDA Crop Profile for Christmas Trees in the North Carolina Mountains. 11/99.
Personal Observation. NC Christmas Tree Crop tour with NC Cooperative Extension Service. 6/25-27/00.
Pesticide labels. Metasystox-R, Dimethoate 4EC, Di-Syston 15%, Lorsban 4E. 6/00.
Sidebottom, J. Personal communication. 6/22/00.
Sidebottom, J. 1999. NC Crop Profile Christmas Trees, Mountain.
1997 North Carolina Christmas Tree Survey. NCASS. 3/98. www.agr.state.nc.us/stats/trees/xmastree.htm

Prepared By: Michael K. Hennessey
Date: 7/5/00 Time: 17:00

Pest	Organophosphate	Efficacy	Mkt		Class	Alt. Pesticide List	Efficacy	Mkt	Constraints of Alternatives
Crop: Fraser fir Christmas Trees Region: North Carolina Timing: All plant stages									
balsam twig aphid (Major)	disulfoton	(hi		P	esfenvalerate	-	med	Esfenvalerate has an advantage of also controlling adelgid but disadvantage of flaring spider mite. Liquids (esfenvalerate and oxydemeton methyl, 2 apps required) are difficult to apply—coverage/efficacy is poor with hose or mist blower most of the time depending on spacing or size of trees. Chlorpyrifos causes some phytotoxicity. Predators are important and are killed off by foliar sprays of esfenvalerate and chlorpyrifos. Tau-fluvalinate (good efficacy), imidacloprid, azadirachtin (good efficacy) and bifenthrin are registered but not used. Triazimate and pymetrozine are in EPA pipeline.
	chlorpyrifos	-	med		O	imidacloprid	-	lo	
	dimethoate		lo		O	cinnamaldehyde	-	lo	
	oxydemeton methyl		lo						
spruce spider mite (Major)	disulfoton	(hi		O	abamectin		lo	Oil, tau-fluvalinate (good efficacy adults only), pyridaben (good efficacy), and bifenthrin (not effective on eggs) are registered for this but not used. Hexythiazox doesn't control adults. Bifenazate (good efficacy) and clofentazine are in research pipeline. Chlorpyrifos causes some phytotoxicity.
	oxydemeton methyl		lo		O	hexythiazox	-	lo	
	chlorpyrifos		med						
hemlock rust mite (Minor)	dimethoate	(hi		O	sulfur		lo	Pyridaben (good efficacy) is registered but not used. Sulfur was experimental use only. Clofentazine in research pipeline.
rosette bud mite (Minor)	dimethoate	(med						Clofentazine in research pipeline.
balsam wooly adelgid (Minor)	oxydemeton methyl		lo			imidacloprid		lo	Esfenvalerate took over for lindane that was cancelled. It must be applied by high-pressure hose. Older trees with infestations are culled. Predators are important and they are killed off by sprays. Pymetrozine is in research pipeline. Some phytotoxicity with chlorpyrifos, oil, and soap.
	chlorpyrifos		lo			esfenvalerate	(hi	
						oil		lo	
						soap		lo	

OP TOLERANCE REASSESSMENT USE/USAGE MATRIX - PEST SUMMARY

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Pest	Organophosphate	Efficacy	Mkt		Class	Alt. Pesticide List	Efficacy	Mkt	Constraints of Alternatives
Crop: Fraser fir Christmas Trees Region: North Carolina Timing: All plant stages									
white grubs (Minor)	chlorpyrifos		lo		O	methyl bromide	(med	Soil application. Preplant soil methyl bromide is for root rot but would kill grubs also. Halofenozide soil use in EPA pipeline.

ADDITIONAL INFORMATION: For above, (-excellent, -good, -poor. Market share: hi=>20%, med=5-20%, lo=<5%.
Class: P=pyrethroid, O=other

SOURCES:

USDA Crop Profile for Christmas trees in North Carolina mountains (Fraser fir)

Sidebottom, J. 1/00. Registered alternatives for Fraser fir.

Sidebottom, J. 6/00. Alternatives to Di-syston 15G.

Personal observation and talks with growers and extension personnel D. Hundley, J. Sidebottom, J. Moody, J. Owen. Extension tour of Fraser fir in NC. 6/25-27/00.

Prepared By: M. Hennessey, Entomologist, OPP/BEAD, 703-308-7076.

Date: 7/5/00 Time: 17:00